高等学校建筑类专业英语规划教材

Environmental science and Engineering

环境科学与工程专业

石 辉 主编

中国建筑工业出版社

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图书在版编目(CIP)数据

高等学校建筑类专业英语规划教材. 环境科学与工程专业/石辉主编. —北京：中国建筑工业出版社，2010.8
ISBN 978-7-112-12301-8

Ⅰ. ①高… Ⅱ. ①石… Ⅲ. ①环境科学-高等学校-教材②环境工程-高等学校-教材 Ⅳ. ①X

中国版本图书馆 CIP 数据核字(2010)第 143574 号

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中国建筑工业出版社出版、发行(北京西郊百万庄)

各地新华书店、建筑书店经销

北京天成排版公司制版

北京建筑工业印刷厂印刷

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开本：787×1092 毫米 1/16 印张：21½ 字数：644 千字

2010 年 8 月第一版 2010 年 8 月第一次印刷

定价：**40.00** 元

ISBN 978-7-112-12301-8
(19562)

本书以城市环境为主线，介绍了五个方面的环境问题。在第一篇中主要介绍了全球环境问题和可持续发展的基本理念，包括全球环境问题、城市环境问题、人居环境问题、城市的可持续发展；第二篇主要介绍了城市的水环境，包括水的利用和有效性、水质参数、安全饮水、饮用水净化、供水系统、水污染、废水的特征、废水处理技术、废水中固体和生物固体的处理、废水的回用等内容；第三篇主要介绍了城市的空气环境，包括空气污染的类型和污染源、空气污染的环境效应、颗粒污染物的控制、气态污染物的控制和大气环境影响评价；第四篇主要介绍了城市的固体废物处理以及声环境的保护，包括城市固体废物的特征、固体废物的产生、有害废物的贮存和处理，噪声对健康的影响、噪声的控制；第五篇以城市的生态环境为主，主要介绍了城市树木绿地的环境效益、绿地减缓大气颗粒物污染、屋顶绿化的结构和功能、生态城市建设。为了保证内容的完整性，还有一部分阅读材料对课程的内容做一补充，以便于根据课时选择使用。为了使该教材能发挥更大的作用，在教材中增加四个附录，一是为如何进行科学写作，二是科技论文写作的一些技巧，三是英文摘要的写作技巧，四是与环境科学相关的一些网站，希望能对学生的学习提供一些帮助。

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前　言

随着科学技术的发展和学术交流的日益频繁，一方面我们需要学习国外的先进科学技术，另一方面需要将自己的研究成果介绍给世界，这些都离不开专业外语这个平台。经过多年的公共外语学习，现代大学生的外语水平有了较大的提高；但是一旦进入专业文献，学生们经常不知所云；尤其是当他们看到所熟悉的外语单词变成了字同义不同的专业词汇时，会产生既熟悉又陌生的感觉；当他们想用外语表达专业术语时，贫乏的专业词汇、生疏的语法结构又常使他们无从入手。

专业外语具有很强的专业性、针对性和应用性，因而专业外语学习与公共外语学习就有很大的区别。专业外语教学基于外语知识和专业知识于一体，因而专业外语的教学就不同于公共外语教学和专业课教学，它要求教师在教学方法上要有其独特性，不仅要适应学生外语学习的特点，又要适应专业学习的要求，适应学生的接受能力。专业外语是学生已学习了大学英语及一定的专业知识后，进一步熟练掌握和运用专业外语词汇和翻译技术的一门实用性很强的专业课，其任务是使学生掌握外语的特点和翻译方法，准确、流畅地阅读和翻译专业资料和科技论文，并学会用外文书写简短的论文摘要，为以后更好地吸收和交流国内外专业的先进知识和技术打好基础。

专业英语是环境科学与工程专业的专业基础必修课，在教学中起到了承前启后的关键作用。它保证了英语教学的连续性，培养和提高了学生阅读专业英语文献的能力，为以后的毕业论文环节中能顺利检索和阅读英文资料奠定了一定的基础。但现有的环境科学与工程专业外语教材主要关注各种环境污染的治理，如水污染治理、大气污染治理、噪声污染治理、固废污染治理等，极少涉及别的方面。随着环境保护基本原则由末端治理向预防的转变，专业外语的教学也应该适应这种变化，而这恰恰是当前专业外语教材中存在的不足。

考虑到当前面临的环境问题、课堂教学的时间和学生知识结构的调整，本书以城市环境为主线，介绍了5个方面的环境问题。在第一篇中主要介绍了全球环境问题和可持续发展的基本理念，包括全球环境问题、城市环境问题、人居环境问题、城市的可持续发展；第二篇主要介绍了城市的水环境，包括水的利用和有效性、水质参数、安全饮水、饮用水净化、供水系统、水污染、废水的特征、废水处理技术、废水中固体和生物固体的处理、废水的回用等内容；第三篇主要介绍了城市的空气环境，包括空气污染的类型和污染源、空气污染的环境效应、颗粒污染物的控制、气态污染物的控制和大气环境影响评价；第四篇主要介绍了城市的固体废物处理以及声环境的保护，包括城市固体废物的特征、固体废物的产生、有害废物的贮存和处理，噪声对健康的影响、噪声的控制；第五篇以城市的生态环境为主，主要介绍了城市树木绿地的环境效益、绿地减缓大气颗粒物污染、屋顶绿化的结构和功能、生态城市建设。为了保证内容的完整性，还有一部分阅读材料对课程的内容做一补充，以便于根据课时选择使用。为了使该教材能发挥更大的作用，在教材中增加4个附录，一是如何进行科学写作，二是科技论文写作的一些技巧，三是英文摘要的写作

技巧，四是与环境科学相关的一些网站，希望能对学生的学习提供帮助。

全书的框架体系和大纲由西安建筑科技大学的石辉提出，其中 Unit1～Unit4 由石辉编写，Unit5～Unit9 由西安建筑科技大学的高湘编写，Unit10～Unit14 由西安建筑科技大学的王怡编写，Unit15～Unit19 由西安建筑科技大学的曹利编写，Unit20～Unit22 由西安科技大学的田华编写，Unit23～Unit24 由王怡编写，Unit25～Unit28 由石辉编写，附录部分的资料由石辉和高湘负责收集整理。

本书涉及到了环境科学的各个方面，除作为专业外语教材使用外，还可以起到环境科学导论的作用，适合于环境科学相关的专业的本科生、硕士研究生使用，包括环境科学、环境工程、给水排水、资源环境与城乡规划、地理科学等。同时，也可以作为相关专业科技人员的参考书。

西安建筑科技大学是以土建类为特色的综合性大学，环境科学和环境工程专业是其重要的组成部分。同时，环境工程是国家的特色专业、国家重点学科，环境科学为陕西省重点学科、国家重点学科的培育学科。为了进一步提高教学质量，凝练专业特色，西安建筑科技大学教务处组织了建筑类专业外语的研讨，在充分讨论的基础上，决定编写以土建类核心专业为基础的特色专业外语系列教材，以满足专业建设的需要。环境科学与工程专业外语是建筑类专业外语规划教材中的一册。在系列教材研讨和编写过程中，西安建筑科技大学以重点教材建设项目给予资助，教务处庞丽娟副处长在教材研讨和编写过程中做了大量的组织管理工作，使得该教材能得以顺利完成。西安建筑科技大学建筑学院、土木学院、环境与市政工程学院、信控学院、艺术学院的教师在研讨中提出了许多有益的建议。在此，向关心和支持教材编写的单位和个人表示衷心的感谢。对于书中所采用文献资料的作者和单位表示诚挚的谢意。

本书在选材上，尽量选取正式出版的外文期刊文献和书籍，力求保证内容的科学性和准确性，但由于编者学术水平所限，在文章的选材和编排方面还存在着不足，恳请读者给予批评指正。

编　者

2010 年 6 月

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CONTENS

Part A Global Environmental Problems and Sustainable Development

Unit 1 Global Environmental Problems

More than a generation ago scientists detected radioactive strontium from atomic tests in reindeer meat and linked DDT to the non-viability of bird eggs. Ever since then, if not before, science has had a central role in shaping what count as environmental problems. During the 1980s environmental scientists and environmentalists called attention, in particular, to analyses of carbon dioxide concentrations in polar ice, measurements of upper atmospheric ozone depletion, remote sensing assessments of tropical deforestation, and, most notably, projections of future temperature and precipitation changes drawn from computation-intensive atmospheric circulation models. This coalition of environmental activism and "planetary science" stimulated a rapid rise in awareness and discussion of global environmental problems. The global environmental problem is a growing concern, and needs to be attended to immediately. Spreading awareness of environmental problems, and responding to them without delay is absolutely necessary to deal with the global problem effectively.

1. Climate Change

Global warming is becoming a critical issue again with the wild weather occurring all over the world. The biggest contributer to global warming is us, who are too reckless in are use of power and making products.

The temperature near the surface of the earth is determined by the balance between solar radiation energy and heat reflected from earth to outer space. Sunlight warms the surface of the earth, which then cools down when the heat (infrared rays) is released from it. If heat exchange were this simple, then the surface of the earth would cool down rapidly as soon as solar radiation stops, with only heat reflection continuing. In reality, however, heat-absorbing atmospheric gases absorb a certain percentage of heat (infrared rays) reflected from the surface of the earth. The atmosphere, thus warmed, radiates infrared rays out toward space and back toward the surface of the earth, warming the latter. In this manner, the earth surface temperature is kept at around 15℃ (global average), realizing an environment suited for the existence of humans, animals, plants and other life forms. The natural process of heating the surface of the earth by sunlight is called the "greenhouse effect", and the infrared-absorbing gases in the atmosphere are called "greenhouse gases". If not for greenhouse gases, the temperature of the

earth would drop by over 30℃ to about −18℃.

Since the Industrial Revolution at the end of the 18th century, there has been a marked increase in the emission of greenhouse gases (mainly carbon dioxide), in proportion to industrial expansion. As well, artificial greenhouse gases that did not exist before the Industrial Revolution, such as CFC (chlorofluorocarbon) and sulfur hexafluoride, have been produced, and are being released into the atmosphere. Increased greenhouse gases destroy the heat exchange balance, keeping greater amounts of heat in the atmosphere and on the earth (i. e. intensifying the greenhouse effect) and raising the temperature near the surface of the earth to undesirable levels. This phenomenon is called global warming.

2. Ozone Depletion

The ozone layer, situated in the stratosphere about 15 to 30km above the earth's surface, plays the important role of "space suit" that protects us living beings by absorbing harmful ultraviolet radiation (UVB) from the sun. The ozone layer is currently being destroyed by CFCs and other substances, its depletion progressing globally except in the tropical zone. The ozone layer is disappearing at a particularly high rate in high-latitude areas. In the Antarctic Circle, a large ozone hole has been observed for eight consecutive years from 1989 through 1996. Destruction of the ozone layer increases the amount of harmful ultraviolet radiation (UVB), which in turn can result in increased cases of skin cancer, and visual impediments such as cataract. It can also hinder the growth of plants and negatively impact small living organisms, such as zooplankton, phytoplankton, shrimp larvae and the young of fish.

3. Biodiversity Loss

Biologists most often define "biological diversity" or "biodiversity" as the "totality of genes, species, and ecosystems of a region". An advantage of this definition is that it seems to describe most circumstances and present a unified view of the traditional three levels at which biological variety has been identified. Biodiversity provides many ecosystem services that are often not readily visible. It plays a part in regulating the chemistry of our atmosphere and water supply. Biodiversity is directly involved in water purification, recycling nutrients and providing fertile soils. Experiments with controlled environments have shown that humans cannot easily build ecosystems to support human needs; for example insect pollination cannot be mimicked by human-made construction, and that activity alone represents tens of billions of dollars in ecosystem services per annum to humankind.

During the last century, some studies show that about one eighth of known plant species are threatened with extinction. Some estimates put the loss at up to 140000 species per year (based on Species-area theory) and subject to discussion. Almost all scientists acknowledge that the rate of species loss is greater now than at any time in human history, with extinctions occurring at rates hundreds of times higher than background extinction rates. The factors that threaten biodiversity

have been variously categorized, such as habitat destruction, overkill, introduced species, pollution, human over population, and overharvesting.

4. Acid Rain

"Acid rain" is a popular term referring to the deposition of wet (rain, snow, sleet, fog and cloudwater, dew) and dry (acidifying particles and gases) acidic components. A more accurate term is "acid deposition". Distilled water, which contains no carbon dioxide, has a neutral pH of 7. Liquids with a pH less than 7 are acidic, and those with a pH greater than 7 are basic. "Clean" or unpolluted rain has a slightly acidic pH of about 5.2, because carbon dioxide and water in the air react together to form carbonic acid, a weak acid (pH 5.6 in distilled water), but unpolluted rain also contains other chemicals. The extra acidity in rain comes from the reaction of primary air pollutants, primarily sulfur oxides and nitrogen oxides, with water in the air to form strong acids (like sulfuric and nitric acid). The main sources of these pollutants are industrial power-generating plants and vehicles.

The most important gas which leads to acidification is sulfur dioxide. Emissions of nitrogen oxides which are oxidized to form nitric acid are of increasing importance due to stricter controls on emissions of sulfur containing compounds. 70 Tg (S) per year in the form of SO_2 comes from fossil fuel combustion and industry, 2.8 Tg (S) from wildfires and 7～8 Tg (S) per year from volcanoes. The principal cause of acid rain is sulfur and nitrogen compounds from human sources, such as electricity generation, factories, and motor vehicles. Coal power plants are one of the most polluting. The gases can be carried hundreds of kilometres in the atmosphere before they are converted to acids and deposited. In the past, factories had short funnels to let out smoke, but this caused many problems locally; thus, factories now have taller smoke funnels. However, dispersal from these taller stacks causes pollutants to be carried farther, causing widespread ecological damage.

5. Desertification

Desertification (or desertization) is the degradation of land in arid, semi-arid and dry sub-humid areas resulting primarily from human activities and influenced by climatic variations. Current desertification is taking place much faster worldwide than historically and usually arises from the demands of increased populations that settle on the land in order to grow crops and graze animals.

A major impact of desertification is biodiversity loss and loss of productive capacity, for example, by transition from land dominated by shrublands to non-native grasslands. In the semi-arid regions of southern California, many coastal sage shrub and chaparral ecosystems have been replaced by non-native, invasive grasses due to the shortening of fire return intervals. This can create a monoculture of annual grass that can not support the wide range of animals once found in the original ecosystem. In Madagascar's central highland plateau, 10% of the entire country has been lost to desertification due to slash and burn agricul-

ture by indigenous peoples. In Africa, if current trends of soil degradation continue, the continent might be able to feed just 25% of its population by 2025, according to UNU's Ghana-based Institute for Natural Resources in Africa. Desertification is induced by several factors, primarily anthropogenic beginning the Holocene area. The primary reasons for desertification are overgrazing, overcultivation, increased fire frequency, water impoundment, deforestation, overdrafting of groundwater, increased soil salinity, and global climate change.

6. Deforestation

Deforestation is the conversion of forested areas to non-forest land for use such as arable land, pasture, urban use, logged area, or wasteland. Generally, the removal or destruction of significant areas of forest cover has resulted in a degraded environment with reduced biodiversity. In many countries, massive deforestation is ongoing and is shaping climate and geography. Deforestation results from removal of trees without sufficient reforestation, and results in declines in habitat and biodiversity, wood for fuel and industrial use, and quality of life.

From about the mid-1800s, around 1852, the planet has experienced an unprecedented rate of change of destruction of forests worldwide. Forests in Europe are adversely affected by acid rain and very large areas of Siberia have been harvested since the collapse of the Soviet Union. In the last two decades, Afghanistan has lost over 70% of its forests throughout the country. However, it is in the world's great tropical rainforests where the destruction is most pronounced at the current time and where clearcutting is having an adverse effect on biodiversity and contributing to the ongoing Holocene mass extinction.

Generally, the removal or destruction of significant areas of forest cover has resulted in a degraded environment with reduced biodiversity. In many countries, massive deforestation is ongoing and is shaping climate and geography. Deforestation is a substantial contributor to global warming, and although 70% of the oxygen we breathe comes from the photosynthesis of marine green algae and cyanobacteria, the mass destroying of the world's rain forests is not beneficial to our environment. In addition, the incineration and burning of forest plants in order to clear land releases tonnes of CO_2 which increases the impact of global warming.

Deforestation reduces the content of water in the soil and groundwater as well as atmospheric moisture. Deforestation reduces soil cohesion, so that erosion, flooding and landslides often ensue. Forests support considerable biodiversity, providing valuable habitat for wildlife; moreover, forests foster medicinal conservation and the recharge of aquifers. With forest biotopes being a major, irreplaceable source of new drugs (like taxol), deforestation can destroy genetic variations (such as crop resistance) irretrievably.

Shrinking forest cover lessens the landscape's capacity to intercept, retain and transport precipitation. Instead of trapping precipitation, which then percolates to groundwater

systems, deforested areas become sources of surface water runoff, which moves much faster than subsurface flows. That quicker transport of surface water can translate into flash flooding and more localized floods than would occur with the forest cover. Deforestation also contributes to decreased evapotranspiration, which lessens atmospheric moisture which in some cases affects precipitation levels down wind from the deforested area, as water is not recycled to downwind forests, but is lost in runoff and returns directly to the oceans. According to one preliminary study, in deforested north and northwest China, the average annual precipitation decreased by one third between the 1950s and the 1980s.

7. Fresh Water Supply

Uses of fresh water can be categorized as consumptive and non-consumptive (sometimes called renewable). A use of water is consumptive if that water is not immediately available for another use. Losses to sub-surface seepage and evaporation are considered consumptive, as is water incorporated into a product (such as farm produce). Water that can be treated and returned as surface water, such as sewage, is generally considered non-consumptive if that water can be put to additional use.

It is estimated that 69% of worldwide water use is for irrigation, with 15%～35% of irrigation withdrawals being unsustainable. As global populations grow, and as demand for food increases in a world with a fixed water supply, there are efforts underway to learn how to produce more food with less water, through improvements in irrigation methods and technologies, agricultural water management, crop types, and water monitoring. It is estimated that 15% of worldwide water use is industrial. Major industrial users include power plants, which use water for cooling or as a power source (i. e. hydroelectric plants), ore and oil refineries, which use water in chemical processes, and manufacturing plants, which use water as a solvent. The portion of industrial water usage that is consumptive varies widely, but as a whole is lower than agricultural use. It is estimated that 15% of worldwide water use is for household purposes. These include drinking water, bathing, cooking, sanitation, and gardening. Basic household water requirements have been estimated at around 50 liters per person per day, excluding water for gardens. Drinking water is water that is of sufficiently high quality so that it can be consumed or used without risk of immediate or long term harm. Such water is commonly called potable water. In most developed countries, the water supplied to households, commerce and industry is all of drinking water standard even though only a very small proportion is actually consumed or used in food preparation.

According to the World Business Council for Sustainable Development, the concept of water stress is applies to situations where there is not enough water for all uses, whether agricultural, industrial or domestic. Defining thresholds for stress in terms of available water per capita is more complex, however, entailing assumptions about water use and its efficiency. Nevertheless, it has been proposed that when annual per capita renewable freshwa-

ter availability is less than 1700 cubic meters, countries begin to experience periodic or regular water stress. Below 1000 cubic meters, water scarcity begins to hamper economic development and human health and well-being.

Water pollution is one of the main concerns of the world today. The governments of many countries have striven to find solutions to reduce this problem. Many pollutants threaten water supplies, but the most widespread, especially in underdeveloped countries, is the discharge of raw sewage into natural waters; this method of sewage disposal is the most common method in underdeveloped countries, but also is prevalent in quasi-developed countries. Sewage, sludge, garbage, and even toxic pollutants are all dumped into the water. Even if sewage is treated, problems still arise. Treated sewage forms sludge, which may be placed in landfills, spread out on land, incinerated or dumped at sea. In addition to sewage, nonpoint source pollution such as agricultural runoff is a significant source of pollution in some parts of the world, along with urban stormwater runoff and chemical wastes dumped by industries and governments.

Water stress can also exacerbate conflicts and political tensions which are not directly caused by water. Gradual reductions over time in the quality and/or quantity of fresh water can add to the instability of a region by depleting the health of a population, obstructing economic development, and exacerbating larger conflicts. Conflicts and tensions over water are most likely to arise within national borders, in the downstream areas of distressed river basins. Additionally, certain arid countries which rely heavily on water for irrigation, are particularly at risk of water-related conflicts.

8. Persist Organic Pollution

Persistent organic pollutants (POPs) are organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes. Because of this, they have been observed to persist in the environment, to be capable of long-range transport, bioaccumulate in human and animal tissue, biomagnify in food chains, and to have potential significant impacts on human health and the environment.

In May 1995, the United Nations Environment Programme Governing Council (GC) decided to begin investigating POPs, initially beginning with a short list of the following twelve POPs, known as the "dirty dozen": aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, and toxaphene. Since then, this list has generally been accepted to include such substances as carcinogenic polycyclic aromatic hydrocarbons (PAHs) and certain brominated flame-retardants, as well as some organometallic compounds such as tributyltin (TBT). The groups of compounds that make up POPs are also classed as PBTs (Persistent, Bioaccumulative and Toxic) or TOMPs (Toxic Organic Micro Pollutants).

Many POPs are currently or were in the past used as pesticides. Others are used in industrial processes and in the production of a range of goods such as solvents, polyvinyl

chloride, and pharmaceuticals. Though there are a few natural sources of POPs, most POPs are created by humans in industrial processes, either intentionally or as byproducts.

POPs released to the environment have been shown to travel vast distances from their original source. Due to their chemical properties, many POPs are semi-volatile and insoluble. These compounds are therefore unable to transport directly through the environment. The indirect routes include attachment to particulate matter, and through the food chain. The chemicals' semi-volatility allows them to travel long distances through the atmosphere before being deposited. Thus POPs can be found all over the world, including in areas where they have never been used and remote regions such as the middle of oceans and Antarctica. The chemicals' semi-volatility also means that they tend to volatilize in hot regions and accumulate in cold regions, where they tend to condense and stay. PCBs have been found in precipitation. The ability of POPs to travel great distances is part of the explanation for why countries that banned the use of specific POPs are no longer experiencing a decline in their concentrations; the wind may carry chemicals into the country from places that still use them.

Exposure to POPs can take place through diet, environmental exposure, or accidents. POPs exposure can cause death and illnesses including disruption of the endocrine, reproductive, and immune systems; neurobehavioral disorders; and cancers possibly including breast cancer. The lipid solubility of POPs allows them to bioaccumulate in fatty tissues of animals. Many of the first generation organochlorine insecticides such as DDT were particularly noted for this characteristic.

A study published in 2006 indicated a link between blood serum levels of POPs and diabetes. Individuals with elevated levels of persistent organic pollutants (DDT, dioxins, PCBs and Chlordane, among others) in their body were found to be up to 38 times more likely to be insulin resistant than individuals with low levels of these pollutants, though the study did not demonstrate a cause and effect relationship. As most exposure to POPs is through consumption of animal fats, study participants with high levels of serum POPs are also very likely to be consumers of high amounts of animal fats, and thus the consumption of the fats themselves, or other associated factors may be responsible for the observed increase in insulin resistance. Another possibility is that insulin resistance causes increased accumulation of POPs. Among study participants, obesity was associated with diabetes only in people who tested high for these pollutants. These pollutants are accumulated in animal fats, so minimizing consumption of animal fats may reduce the risk of diabetes. According to the US Department of Veterans Affairs, type 2 diabetes is on the list of presumptive diseases associated with exposure to Agent Orange (which contained the POP dioxin) in the Vietnam War.

9. Over Fishing

Overfishing occurs when fishing activities reduce fish stocks below an acceptable level.

This can occur in any body of water from a pond to the oceans. Ultimately overfishing may lead to resource depletion in cases of subsidised fishing, low biological growth rates and critical low biomass levels (e. g. by critical depensation growth properties). Particularly, overfishing of sharks has led to the upset of entire marine ecosystems. The ability of the fisheries to naturally recover also depends on whether the conditions of the ecosystems are suitable for population growth. Dramatic changes in species composition may establish other equilibrium energy flows that involve other species compositions than had been present before (ecosystem shift). For example, remove nearly all the trout, and the carp might take over and make it nearly impossible for the trout to re-establish a breeding population.

There are three recognized types of overfishing: growth overfishing, recruit overfishing and ecosystem overfishing. A more dynamic definition of economic overfishing may also include a relevant discount rate and present value of flow of resource rent over all future catches.

Sustainable seafood is a movement that has gained momentum as more people become aware about overfishing and environmentally destructive fishing methods. Sustainable seafood is seafood from either fished or farmed sources that can maintain or increase production in the future without jeopardizing the ecosystems from which it was acquired. In general, slow-growing fish that reproduce late in life, such as orange roughy, are vulnerable to overfishing. Seafood species that grow quickly and breed young, such as anchovies and sardines, are much more resistant to overfishing. Several organizations, including the Marine Stewardship Council (MSC), and Friend of the Sea, certify seafood fisheries as sustainable. The MSC has developed an environmental standard for sustainable and well-managed fisheries. Environmentally responsible fisheries management and practices are rewarded with the use of its blue product ecolabel. Consumers concerned about overfishing and its consequences are increasingly able to choose seafood products which have been independently assessed against the MSC's environmental standard and labelled. This enables consumers to play a part in reversing the decline of fish stocks.

10. Megacities

A megacity is usually defined as a metropolitan area with a total population in excess of 10 million people. Some definitions also set a minimum level for population density (at least 2000 persons/km^2). Megacities can be distinguished from global cities by their rapid growth, new forms of spatial density of population, formal and informal economics, as well as poverty, crime, and high levels of social fragmentation. A megacity can be a single metropolitan area or two or more metropolitan areas that converge upon one another. The terms conurbation, metropolis and metroplex are also applied to the latter. The terms megapolis and megalopolis are sometimes used synonymously with megacity.

In 1800, only 3% of the world's population lived in cities, a figure that has risen to 47% by the end of the twentieth century. In 1950, there were 83 cities with populations ex-